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# Notes on *Sarcinodes reitutaria* (WALKER) and Its Allies, with Descriptions of Three New Species from Southeast Asia (Lepidoptera, Geometridae, Oenochrominae)\*

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*Sarcinodes reitutaria* was described by WALKER in 1862 under the genus *Auxima* from Darjeeling, and has been divided into four subspecies: a nominal subspecies *reitutaria* (WALKER), *perakaria* SWINHOE from Malaya, *sumatraria* (WALKER) from Sumatra and *yaeyamana* INOUE from Japan. Through the courtesy of Dr. H. INOUE, Otsuma Women's University, Iruma and Dr. M. OWADA, the National Science Museum (Nat. Hist.), Tokyo, I could examine a number of specimens of *Sarcinodes* from Southeast Asia and Japan. As the result of my examination, it was proved that *perakaria*, *sumatraria* and *yaeyamana* are three distinct species and not conspecific with *reitutaria*. Besides these species mentioned above, in this paper three species related to *reitutaria*, one from Thailand and two from the Philippines, will be described as new. All the type specimens designated here are preserved in the National Science Museum (Nat. Hist.), Tokyo, unless otherwise stated.

## *Sarcinodes reitutaria* (WALKER) (Figs. 1 – 3)

*Auxima reitutaria* WALKER, [1862], *List Specimens lepid. Insects Colln Br. Mus.*, 26: 1527.

*Mergana reitutaria*: MOORE, [1867], *Proc. zool. Soc. Lond.*, **1867**: 624.

*Sarcinodes reitutaria*: BUTLER, 1886, *Illust. typical Specimens Lepid. Heterocera Colln Br. Mus.*, **6**: 59, pl. 115, figs. 1, 2.

*Sarcinodes reitutaria* var. *aegrota* BUTLER, 1886, *ibid.*: 60, pl. 115, figs. 3, 4.

Expanse. ♂ 52 – 60 mm. ♀ 58 – 62 mm.

Male genitalia (Fig.11). Uncus triangular; apical portion produced caudally, with bluntly pointed apex. Gnathos with a trigonal medial plate. Valvae asymmetrical; costa and sacculus broadly sclerotized; a sclerotized lobe arising below costa at two-thirds from base; sacculus with a hairy thumb-like membraneous process near middle of dorsal margin; terminal process of sacculus thorn-like, longer and thicker in left valva; a small projection arising from base of terminal process of sacculus deeply

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bifurcate. Aedeagus elongate, well sclerotized, with its apical portion strongly serrate and scobinated; vesica unarmed, bearing a short membranous tube beyond middle. 8th sternite with caudal margin slightly raised bilaterally.

Female genitalia (Fig.18). Sterigma strongly sclerotized. Ductus bursae elongate, membranous, weakly furrowed. Corpus bursae ovate; signum short, longitudinally sclerotized.

Specimens examined. India: Khasi Hill, 1♂, V. 1973; Darjeeling (2,100 m), 1♀, 8.IX. 1983 (M. OWADA). Malaya: Taiping, Perak, 4♂1♀, VII. 1987; Cameron Highlands, 1♂ 1♀, 1984, 1♀, 14. VII. 1972 (C. CHUA); Fraser's Hill (1,300 m), 1♂, 27–30. IV. 1986 (S. SAITO), 2♂1♀, 17–19.VIII. 1987 (M. OWADA); Genting Highlands (1,700 m), 1♂, 6–8. IV. 1986 (K. YAZAKI). Thailand: Doi Suthep, 1♂, 8–10. VII. 1966 (H. INOUE); Doi Inthanon, 1♂, V. 1982; Doi Pui (1,400 m), 1♂, 7–9. IX. 1987 (M. OWADA). Indonesia: Brastagi, Sumatra, 1♂, 7. V. 1984.

*Distribution.* NE. India, Burma, N. Thailand (unrecorded), Vietnam, Malaya, Sumatra, Borneo.

*Remarks.* This species shows a slight variation in the male genitalia. As far as I know, the Malayan and Thai specimens (Figs.12–15) are distinguished from the Indian specimens by the following characters: subcostal lobe is usually broad, nearly quadrate, terminal process of left sacculus is often stout, and caudal margin of 8th sternite is highly raised bilaterally. But these differences seem to be individual and/or geographical variations, not specific distinctions. It is at present impossible for me to separate this varied species into some geographical races for lack of material, especially from NE. India. Further material from Southeast Asia including NE. India are required to understand exact subspecific variation.

*Sarcinodes yaeyamana* INOUE **stat. nov.**

(Figs. 5–6)

*Sarcinodes restitutaria yaeyamana* INOUE, 1976, *Tinea* **10** (2): 7.

Expanse. ♂ 46–50 mm. ♀ 52–54 mm.

Very similar to *restitutaria*, but somewhat smaller in size. Wings darker and less reddish than in *restitutaria*; median shade of forewing fuscous, more conspicuous than in *restitutaria*. Underside with median line blackish brown instead of rufous in *restitutaria*.

Male genitalia (Fig. 16). Nearly as in *restitutaria*. A digitate sclerotized process, which is absent in *restitutaria*, arising at middle of inner surface of valva, strongly bent inwards beyond middle; terminal process of left sacculus slenderer than in *restitutaria*, truncate at apex; terminal process of right sacculus much longer than in *restitutaria*; a small projection of sacculus not bifurcate. Aedeagus as in *restitutaria*. 8th sternite raised caudally, with caudal margin rounded.

Female genitalia (Fig. 19). Similar to *restitutaria*, but sterigma rather small, signum extremely long and extending into ductus bursae.

Specimens examined. Japan: Holotype, ♀ and Paratype, ♀, Mt. Banna, Ishigakijima I., 24. IV. 1973 (Y. IMAMURA); Shiramizu, Iriomotejima I., 1♂, 23. VIII. 1971 (S. AZUMA). Taiwan: Lushan Spa. (1,200 m), Nantou, 1♀, 30. VII. – 1. VIII. 1984 (K. YAZAKI); Sun-Moon Lake (727 m), Nantou, 1♂, 14. VII. 1964 (H. INOUE); Kuantaoshi, Nantou, 1♂, 10. VIII. 1972 (S. YAMANE); Hori [Puli], Nantou, 1♂, VIII. 1952 (S. HIRAYAMA); Wushe, Nantou, 1♂, Spring, 1963; Hungyeh Spa. (200 m), Hualien, 1♂, 20. VIII. 1974 (Y. KISHIDA); "C. Taiwan", 5♂, 1959.

*Distribution.* Japan (Yaeyama Islands), Taiwan, ? W. China.

*Remarks.* INOUE (1976) described this species based on three female specimens from Ishigakijima I., Japan as a subspecies of *S. reitutaria* (WALKER). After examining the male and female genitalia I found that *yaeyamana* is a distinct species. From the male genitalia, especially in the structure of valva and the shape of aedeagus, *yaeyamana* is considered to be most closely related to *reitutaria*. The Taiwan representative, wrongly regarded as *reitutaria* by PROUT (1921) and MATSUMURA (1931), is entirely identical with *yaeyamana* in the superficial appearance as well as in the genital structures. The specimen figured by CHU (1981: 113, pl.29, fig.763) as *reitutaria* seems to represent this species.

*Sarcinodes perakaria* SWINHOE **stat. rev.**

(Fig. 4)

*Sarcinodes perakaria* SWINHOE, 1899, *Ann. Mag. nat. Hist.*, (7) 3: 110.

*Sarcinodes reitutaria perakaria*: PROUT, 1921, in SEITZ, *Macrolepid. World* 12: 28.

Expanse. ♂ 58 mm.

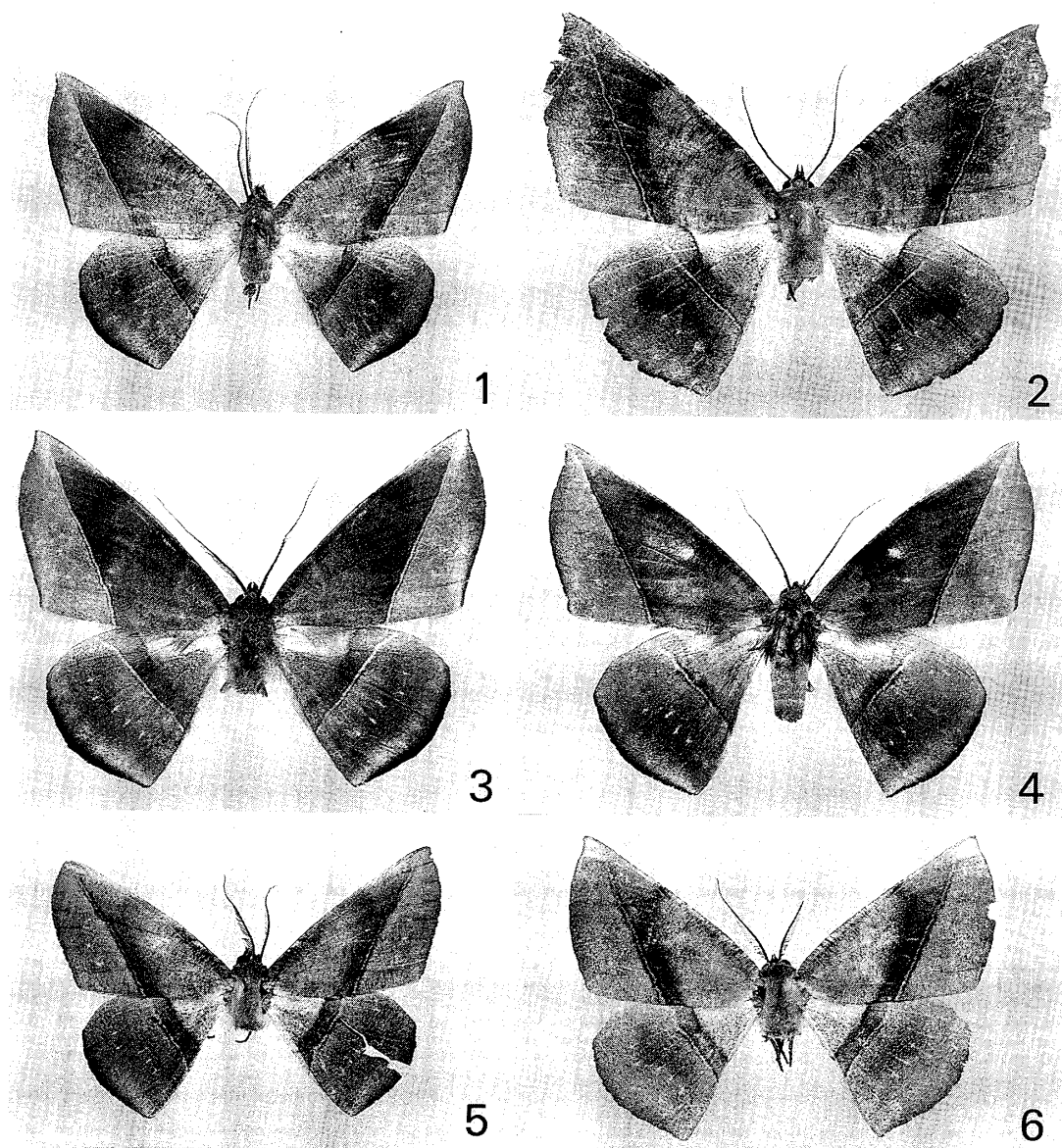
Similar to *reitutaria*, but readily separable by dark purplish brown wings and a large yellowish white discal spot. In underside of forewing postmedian line less oblique and more proximally situated than in *reitutaria*.

Male genitalia (Fig.17). Apical portion of uncus much shorter with truncate apex. Gnathos more strongly sclerotized. Valvae slightly asymmetrical; costa terminating in a free lobe with round apex; subcostal lobe strongly sclerotized; a stout sclerotized process arising from terminal end of sacculus, extending inwardly along dorsal margin of sacculus. Aedeagus without apical serration and scobination; vesica with a long branch beyond middle; cornuti consist of a bunch of short spines. 8th sternite elongate; caudal margin peaked bilaterally, shallowly concave mesally.

Specimen examined. Malaya, Taiping, Perak, 1♂, VII. 1987.

*Distribution.* Malaya.

*Remarks.* This species, described from Perak, Malaya, by SWINHOE (1899), has been treated as a Malayan subspecies of *reitutaria* since PROUT (1921). An examination of photograph of the type specimen(♀) taken by Mr. M. D. SOMMERER at British Museum (Nat. Hist.) and the male genitalia proved that *perakaria* is not conspecific with *reitutaria* but a good species. Both species seem to occur sympatrically in some localities of Malaya. BARLOW (1982) noted that he had taken both species in the same



Figs. 1-6. *Sarcinodes* spp. 1. *S. restitutaria* (WALKER), ♂, Khasi Hill. 2. *Ditto*, ♀, Darjeeling. 3. *Ditto*, ♂, Malaya. 4. *S. perakaria* SWINHOE, ♂, Malaya. 5. *S. yaeyamana* INOUE, ♂, Japan. 6. *Ditto*, ♀, paratype, Japan.

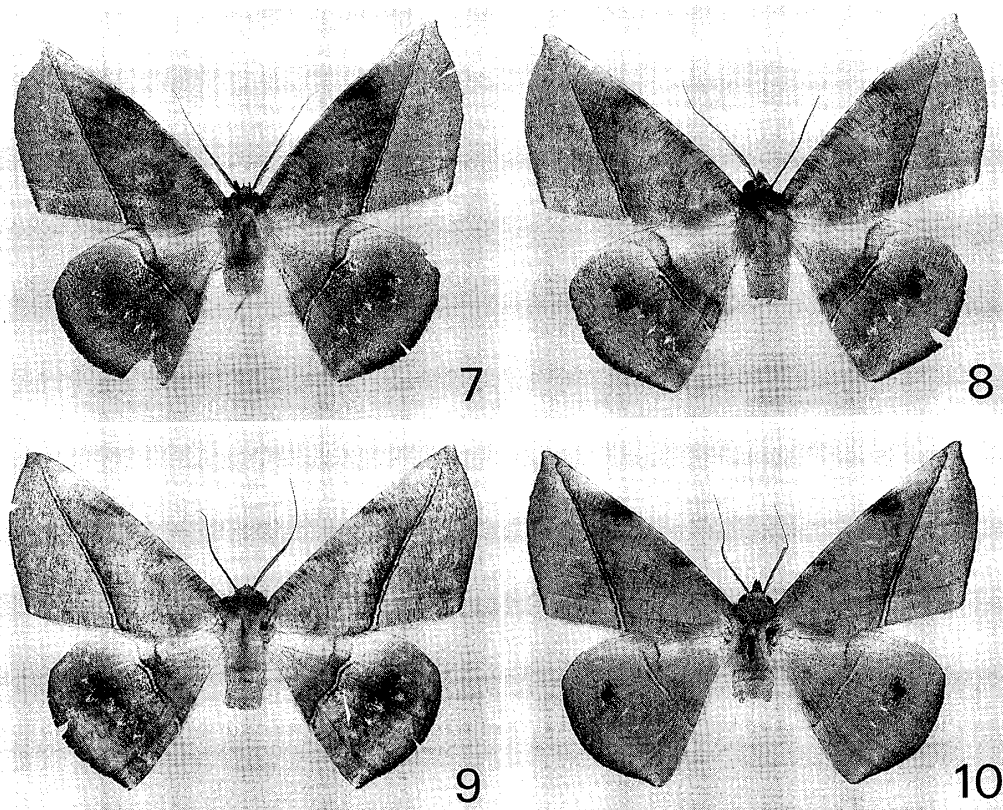
locality, but he regarded *perakaria* as a variety of *restitutaria*. The male specimen of *perakaria* I have examined was also collected together with *restitutaria* at Taiping.

*Sarcinodes flavicans* sp. nov.

(Fig. 9)

Expanse. ♂ 48-52 mm.

Male. Wing maculation nearly the same as in *restitutaria*. Ground color of both wings ochreous. Forewing striated with fuscous, suffused with whitish at costa before



Figs. 7–10. *Sarcinodes* spp. 7. *S. sumatraria* (WALKER), ♂, S. Thailand. 8. *S. fortis* sp. nov., ♂, holotype, N. Thailand. 9. *S. flavicans* sp. nov., ♂, holotype, Mindanao. 10. *S. variabilis* sp. nov., ♂, holotype, Mindanao.

apex; subterminal row of white vein-dots conspicuous. Hindwing scattered with fuscous spots; median line somewhat sinuated, while it is almost straight in *restitutaria*; postmedian row of white vein-dots conspicuous.

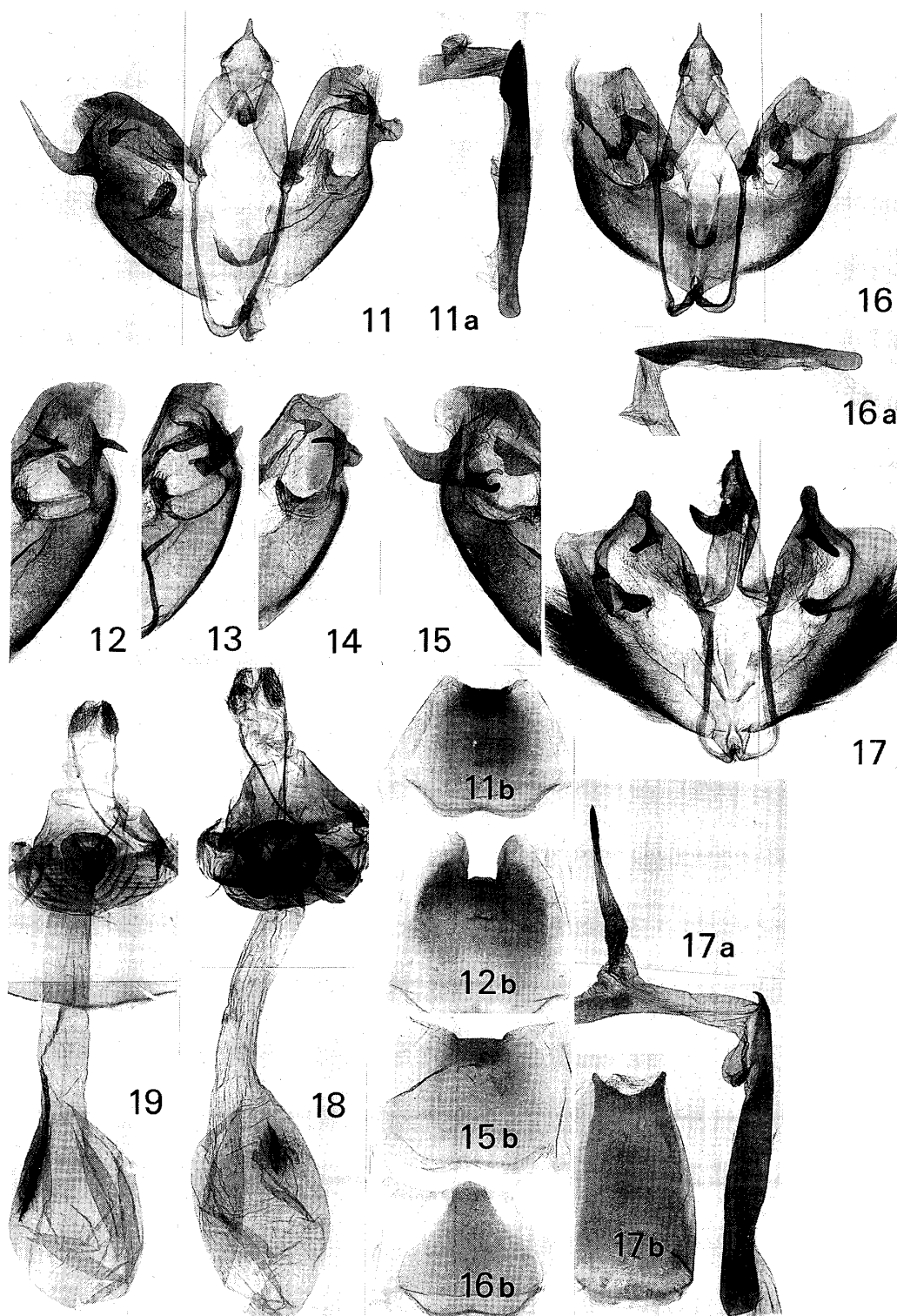
Male genitalia (Fig. 21). Apical portion of uncus much shorter. Valvae slightly asymmetrical; costal lobe well developed, strongly sclerotized along its inner margin, nearly quadrate, peaked with a small process at dorso-proximal angle; sacculus simple, with a small tooth before dorso-caudal end. Aedeagus nearly the same as in *perakaria*; cornuti consist of much longer spines. 8th sternite as in *perakaria*, but much narrower caudally.

Holotype, ♂. Philippines, Mindanao, Davao, Upper Baracatan, Apo Range, Mt. Talomo, 1,100 m, 17–19. VIII. 1985 (M. OWADA) / Genitalia Slide No. NSMT 4572.

Paratype. Same locality as holotype, 1♂, 3–6. VIII. 1985 (M. OWADA).

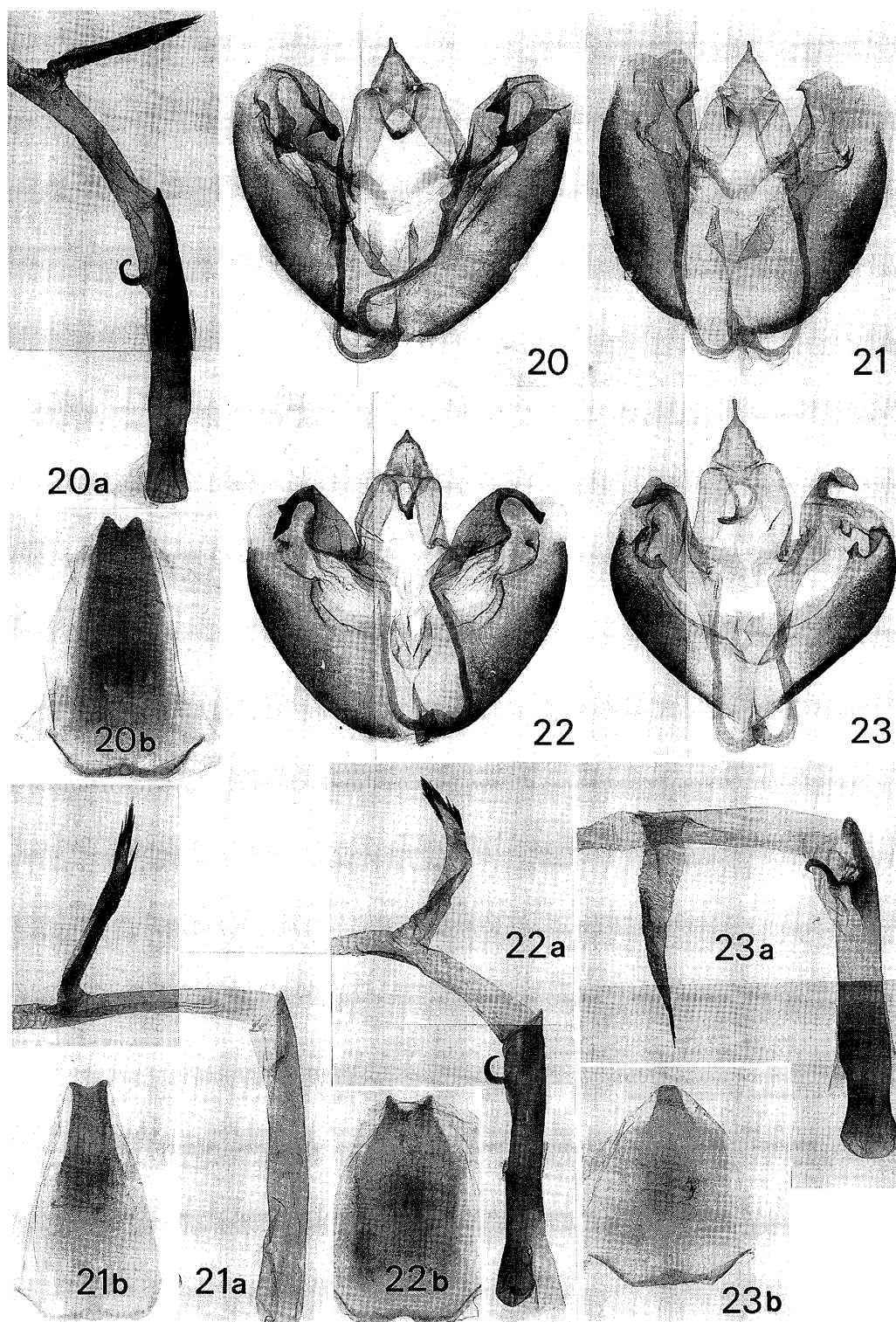
*Distribution.* Philippines (Mindanao).

*Remarks.* This species is characterized by the ochreous color of wings in appearance. Although this and the following three species show a considerable modification in the male genitalia, especially in the shape of valva, they are rather homogeneous each other in the structure of aedeagus. These four species seem to be closer to *perakaria* rather than to *restitutaria* and to *yaeyamana* in having spinous cornuti on vesica.



Figs. 11 – 19. Male and female genitalia of *Sarcinodes* spp. (a) aedeagus. (b) 8th sternite.  
 11 – 15. *S. restitutaria* (WALKER). 11. Khasi Hill. 12, 15. Malaya. 13 – 14. Thailand.  
 16. *S. yaeyamana* INOUE, Japan. 17. *S. perakaria* SWINHOF, Malaya. 18. *S. restitutaria*  
 (WALKER), Darjeeling. 19. *S. yaeyamana* INOUE, Japan.





Figs. 20–23. Male genitalia of *Sarcinodes* spp. (a) aedeagus. (b) 8th sternite. 20. *S. sumatraria* (WALKER). 21. *S. flavicans* sp. nov. 22. *S. fortis* sp. nov. 23. *S. variabilis* sp. nov.

*Sarcinodes sumatraria* (WALKER) **stat. rev.**

(Fig. 7)

*Auxima sumatraria* WALKER, 1866, *List Specimens lepid. Insects Colln Br. Mus.*, **35**: 1577.*Sarcinodes reitutaria*: HAMPSON, 1895, *The Fauna of British India* **3**: 315. (nec WALKER [1862]).*Sarcinodes reitutaria sumatraria*: PROUT, 1921, in SEITZ, *Macrolep. World* **12**: 28.

Expanse. ♂ 49 mm.

Male. Wing maculation almost as in *reitutaria*. Ground color of both wings pale reddish purple; subterminal row of white vein-dots of forewing and postmedian one of hindwing conspicuous. Hindwing with median line somewhat sinuated; a blackish shade just beyond median line between veins  $M_1$  and  $CuA_2$ .

Male genitalia (Fig. 20). Uncus as in *reitutaria*. Valvae slightly asymmetrical; costal lobe well sclerotized, nearly quadrate, its inner margin serrate and produced inwardly; sacculus terminating in a sclerotized flap-like lobe, its dorsal and inner margins serrate; mesal process of sacculus triangular, well sclerotized. Aedeagus nearly as in *perakaria*, but with a short spiral process at ventro-caudal end; cornuti much more in number than in *perakaria*. 8th sternite as in *perakaria*, but much narrower, with caudal margin deeply concaved mesally.

Specimen examined. S. Thailand, Ranong, Kapur, Khlong Nakha (50 m), 1 ♂, 12 – 13. VIII. 1987 (Mamoru OWADA).

*Distribution*. Sumatra, S. Thailand (unrecorded).

*Remarks*. In appearance, this species is easily distinguished by pale reddish purple color of wings and a blackish shade of hindwing. This species was originally described by WALKER (1866) from Sumatra. HAMPSON (1895) considered that it was conspecific with *reitutaria*, and PROUT (1921) treated it as a Sumatran subspecies of *reitutaria*. Mr. M. D. SOMMERER kindly sent me photographs of male genitalia of the type specimen preserved in Oxford University Museum. The structures of the male genitalia clearly show that *sumatraria* is a distinct species. The male genitalia of the Thai specimen I have examined are entirely identical with those of the type specimen.

*Sarcinodes variabilis* sp. nov.

(Fig. 10)

Expanse. ♂ 48 – 50 mm.

Male. Wing maculation nearly the same as in *reitutaria*. Ground color of both wings varying from pale reddish brown to pale chestnut brown; striations much lighter than in *reitutaria*.

Male genitalia (Fig. 23). Apical process of uncus rather long and slender, somewhat dilated towards blunt apex. Valvae rather short, slightly asymmetrical; costa strongly sclerotized, highly raised dorsally, with a stout projection, of which distal half is beak-shaped, with a blunt apex; sacculus bilobed at dorso-caudal end. Aedeagus



nearly as in *sumatraria*; cornuti less in number than in *sumatraria*. 8th sternite raised caudally, with caudal margin almost even.

Holotype, ♂. Philippines, Mindanao, Davao, Upper Baracatan, Apo range, Mt. Talomo, 1,100 m, 17–19. VIII. 1985 (M. OWADA) / Genitalia Slide No. NSMT 4665.

Paratypes. Same data as holotype, 1♂; same locality as holotype, 1♂, 3–6. VIII. 1985 (M. OWADA).

*Distribution.* Philippines (Mindanao).

*Remarks.* This species and *flavicans* are sympatrically distributed in Mindanao, and the moths of both species appear simultaneously. In the male genitalia, this and the following new species are considered to be related to *sumatraria* rather than to *flavicans* in having a spiral process on aedeagus.

### *Sarcinodes fortis* sp. nov.

(Fig. 8)

Expanse. ♂ 51–52 mm.

Male. Very similar to *reitutaria*. Ground color of both wings pale chestnut brown, strongly striated with fuscous; subterminal row of white vein-dots of forewing and postmedian one of hindwing conspicuous.

Male genitalia (Fig. 22). Apical portion of uncus much shorter. Gnathos with a medial plate rather slender. Valvae slightly asymmetrical; costa strongly sclerotized, swollen dorsally; a long club-like process arising from distal end of costa curved ventrally, that of right costa is tapering towards pointed apex with a small apical tooth, and that of left costa is somewhat dilated towards obliquely truncate apex and bearing a conical process before apex; sacculus almost simple, with a small trigonal process at dorso-caudal end, and with a weak ridge at middle of dorsal margin. Aedeagus almost identical with *sumatraria*. 8th sternite as in *perakaria*, but rather narrower caudally.

Holotype, ♂. NE. Thailand, Loei, Phu Rua Natn. Park, 1,200 m, 21. VIII. 1987 (Mamoru OWADA) / Genitalia Slide No. NSMT 4655.

Paratype. N. Thailand, Doi Suthep, 1♂, 8–10. VII. 1966 (H. INOUE), in coll. Dr. INOUE.

*Distribution.* N. Thailand.

*Remarks.* Although it is almost impossible to distinguish this species from *reitutaria* by appearance, the differences in the male genitalia between them are quite distinctive. This species and *reitutaria* show sympatric distribution in the mountaneous area of Thailand.

### Acknowledgements

I wish to express my hearty thanks to Dr. H. INOUE, Otsuma Women's University, Iruma, for his invaluable advice in the course of my study and for his loan of material, and to Dr. M. OWADA, the National Science Museum (Nat. Hist.), Tokyo, for his

kindness in permitting me to examine valuable specimens here used. I am much indebted to Mr. M. D. SOMMERER, München, for his kindness in sending me photographs of moths and genitalia of some type specimens. My deep gratitude is also expressed to Messrs. Y. KISHIDA, S. SUGI and H. YOSHIMOTO for their kindness in offering material.

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### 摘 要

#### ムラサキトガリシャクとその近縁種 (矢崎克己)

ムラサキトガリシャクは石垣島産の3♀を基にINOUE(1976)によって日本のフォーナに加えられ、シッキムを基産地とする *Sarcinodes reitutaria* (WALKER) の亜種 *yaeyamana* INOUE として扱われてきた。 *S. reitutaria* はインド北部からスンドラランドにかけて広く分布し、他に ssp. *perakaria* SWINHOE [マレー半島], ssp. *sumatraria* (WALKER) [スマトラ] の2亜種が知られていた。最近 *reitutaria* の模式産地周辺および東南アジア各地の標本を調べたところ、*yaeyamana*, *perakaria* および *sumatraria* はそれぞれ *reitutaria* とは異なる独立種であることが分かった。本報ではこれらの4種を扱うとともに、タイ国とフィリピンからこれらに近縁と考えられる3新種を記載した。

*Sarcinodes reitutaria* (WALKER) [インド, ビルマ, タイ国, ベトナム, マレー半島, スマトラ, ボルネオ]

*Sarcinodes yaeyamana* INOUE stat. nov. ムラサキトガリシャク [日本, 台湾, ? 中国]

雄交尾器形態からは、本種が *reitutaria* に最も近縁と考えられる。台湾の個体群はこれまで *reitutaria* として扱われていたが、明らかに本種であり、また朱(1981)によって *reitutaria* として図示された中国の標本は本種のように思われる。

*Sarcinodes perakaria* SWINHOE stat. rev. [マレー半島]

*Sarcinodes flavicans* sp. nov. [フィリピン (ミンダナオ)]

本種および以下の3種はそれぞれ雄交尾器 *valva* の形態に著しい特化を示すが、*aedeagus* の形状は均質的で、いずれも *reitutaria* よりも *perakaria* に近縁と考えられる。

*Sarcinodes sumatraria* (WALKER) stat. rev. [スマトラ, タイ国南部]

*Sarcinodes variabilis* sp. nov. [フィリピン (ミンダナオ)]

*Sarcinodes fortis* sp. nov. [タイ国北部]

タイ国北部で *reitutaria* と混棲し、外観による区別は困難。